Japanese Patent Application Laid-open Publication

Japanese Patent Application Laid-open Publication Hei 3-171465
Published: July 24, 1991
Title of the Invention: Disk Loading Apparatus
Japanese Patent Application No.: Hei 1-309927
Filed: November 29, 1989
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Specification

1. Title of the Invention

Disk Loading Apparatus

What is claimed is:

1. A disk loading apparatus comprising

a clamper arranged rotatably for clamping a disk in cooperation with a turntable on which the disk is placed;

a pickup base having the turntable rotatably provided thereon at a position opposed to the clamper;

a biasing means for biasing the pickup base upward while the pickup base is held in a horizontal plane; and

an up down movement regulating means including a licking part which is provided on one side of said pickup base for controlling a biasing force of said biasing means via said pickup base;

whereby said up down movement regulating means is constructed such that the regulation of the biasing force of said biasing means is released during a clamp time in which the disk is clamped and said pickup base is moved downward during a non-clamp time in which the disk is not clamped.

3. Detailed Explanation of the Invention

[Applicable Field in Industry]

The present invention relates to a disk loading apparatus having a faculty for moving a disk into a clamp position.

[Prior Art]

Recently there have been developed various kinds of devices in which recording and reproducing are performed using various kinds of disks such as compact disk and video disk.

Upon loading a disk into such a device, a disk tray on which the disk is place is pushed into a housing of the device and then the disk is moved up or down into a clamp position. In order to perform this loading operation smoothly, there have been proposed various mechanisms in which the disk pushing operation is mechanically related to the disk movement into the clamp position.

For instance, in Japanese Utility Model Application Laid-open Publication No. 60-89654, there is proposed a front disk loading player in which the loading and unloading is carried out by swinging a swaying member having a disk supporting member provided on a housing in such a manner that the disk supporting member can be inserted into and pulled out of a housing.

In a Japanese Utility Model Application Laid-open Publication No. Hei 1-32201, there is proposed another known disk loading apparatus, in which two guide rails are provided near both sides of a disk tray in parallel with a moving direction of the disk tray, and a movable base is moved along the guide rails to move a base pickup in a vertical direction in conjunction with the operation of the disk loading apparatus and to clamp the disk at a given position.

[Problems to be Solved by the Invention]

In the known disk loading apparatus described in the above mentioned Japanese Utility Model Application Laid-open Publication No. 60-89654 in which the disk is moved into a given clamp position by swinging the pickup base, the disk might be clamped onto an inclined turntable. Such an incomplete clamping might injure the disk and the apparatus might be a cause for breakout of the apparatus.

Contrary to this, in the known disk loading apparatus described in the above mentioned Japanese Utility Model Application Laid-open Publication No. Hei 1-32201, since the disk is moved in a vertical direction while its recode surface is held horizontally, the disk is prevented from being clamped in an inclined fashion. However, since the guide rails are provided on both sides of the moving base, the number of parts is increased and a rather complicated mechanism is required. Furthermore, since the moving base is moved up and down with forces applied from both sides, a cam is required for moving these parts in conjunction with each other. Therefore, a manufacturing cost is increased and a maintenance becomes cumbersome.

The present invention has for its object to provide a disk loading apparatus which can positively clamp a disk with the aid of a simple construction.

[Means for Solving the Problems]

According to the invention, a disk loading apparatus comprises:

a clamper arranged rotatably for clamping a disk in cooperation with a turntable on which the disk is placed;

a pickup base having the turntable rotatably provided thereon at a position opposed to the clamper;

a biasing means for biasing the pickup base upward while the pickup base is held in a horizontal plane; and

an up down movement regulating means including a licking part which is provided on one side of said pickup base for controlling a biasing force of said biasing means via said pickup base;

whereby said up down movement regulating means is constructed such that the regulation of the biasing force of said biasing means is released during a clamp time in which the disk is clamped and said pickup base is moved downward during a non-clamp time in which the disk is not clamped.

[Function]

In the disk loading apparatus according to the invention, the pickup base is biased upward by means of the biasing means while the disk is remained in a horizontal state, and thus the turntable can be brought into contact with a central portion of the disk uniformly. Furthermore, the up down movement regulating means is provided on one side of the pickup base, and therefore the number of parts can be reduced.

[Embodiments]

Now an embodiment of the disk loading apparatus according to the invention will be explained concretely with reference to the drawings.

Figs. 1-3 show a whole structure of the disk loading apparatus.

As illustrated in these drawings, at a middle of a housing 1 of the disk loading apparatus including a tray entrance window 1a there are provided tubular positioning portions 3, 3···for positioning a pickup main body 2.

Slide bushes 5 are inserted into the positioning portions 3 such that the bushes are biased upward by means of springs 4. Locking claws 7 formed at lower end portions of the slide bushes 5 are engaged with locking portions 6 of the positioning portions 3 to prevent the slide bushes 5 from being removed (refer to Fig. 3).

To the respective slide bushes 5 supporting an pickup and so on are secured a pickup base 8 by means of bush engage openings 9, 9···.

To the pickup 8 is secured a motor 12 having a shaft 10 to which a turntable 11 is secured. Near the motor 12, supporting members 13 are provided and both ends of a slide shaft 14 having a male screw are rotatably supported by the supporting members 13.

The slide shaft 14 is rotated by a stepping motor 17 by means of pulleys 15 and a belt 16, and a pickup head 19 is moved into a given position precisely by means of the stepping motor 17.

To the slide shaft 14 is secured the pickup head 19 movably along the slide shaft 14 by means of a supporting portion 18 having a female screw. A guide portion 20 having a guide recess is provided on the other end portion of the pickup head 19, and the guide portion 20 is engaged with a guide strip 21 provided on the pickup base 8.

The pickup head 19 is biased toward the turntable 11 by a vertically arranged spring 22 such that the pickup head is urged against the supporting portion 18. By arranging the spring 22 vertically, a space for the spring can be saved.

Above the pickup main body 2, a tray 23 is arranged movably in directions shown by arrows a and b for carrying the disk into a loading position.

On an upper surface of the tray 23, there are formed a disk placing portion 24, a disk removing recess 25, a window 26 from which the disk is exposed, and stoppers 27 which are brought into contact with projecting strips 34 formed at an peripheral portion of a supporting bridge 33 as will be explained later.

On a lower surface of the tray 23, there are provided a pinion gear 28 which is engaged with a rack gear 40 and a guide recess 30 having a cam portion 29. The pinion gear 28 includes a cut-out portion 28a for escaping the rack gear 40.

On the lower surface of the tray 23, there is formed a taper portion 31 between the guide recess 30 and the pinion gear 28, said taper portion serving to actuate a driving strip 38 of a switch 37 in an unloading position.

Above the tray 23, there is arranged the supporting bridge 33 to which is secured rotatably a magnet clamper 32 having insulators arranged along a periphery. The magnet clamper 32 is provided at such a position that in the loading operation the clamper is aligned with the turntable 11.

Near the pickup main body 2, there is arranged a loading mechanism 35.

To the loading mechanism 35 is secured the switch 37 for changing a rotational direction of a driving shaft 45 of a driving motor 47. When the driving strip 38 of the switch 37 is rotated in directions shown by arrows c and d, the power supply to the driving motor 37 is switched on and off and a positive or negative power is supplied to the driving motor 37. The driving strip 38 is rotated by the tape portion 31 of the tray 23 or a taper portion 52 formed at an end of a slide member 52 as will be explained later.

Near the switch 37, is rotatably arranged a large gear 41 having a shaft 39, and the rack gear 40 is secured to this shaft 39.

Near the large gear 41 there are arranged a pulley 43 provided on a shaft 42 and a small gear 44 which is engaged with the large gear 41.

Near the pulley 43, is arranged a driving motor 47 having a shaft 45 to which a small pulley 46 is secured. The driving force of the driving motor 47 is transmitted to the pulley 43 via the small pulley 46 and belt 48.

Near the driving motor 47, a slide member 51 is arranged movably in directions shown by arrows and b along engaging projections 50, 50 provided on a set surface 49.

The slide member 51 has formed therein a slide portion 52 and a rectangular strip portion 53. In the slide portion 52 there are formed a pinion gear 54 which is engaged with the rack gear 40 and a guide recess 56 which includes a can portion 55 for displacing an engagement pin 64 of a gear changing member 66 as will be explained later. It should be noted that the pinion gear 54 has formed therein an escaping portion 54a for the rack gear 40.

In the rectangular strip portion 53, there are formed a guide recess 58 and a cam recess 57 for pushing downward the pickup main body 2 in the loading position into the unloading position.

Into the guide recess 58 formed in the rectangular strip portion 53 is inserted a pin 58a provided on the inner surface of the housing 1 such that the slide member 51 is guided by the pin 58a.

Near the slide member 51, supporting members 59, 59 are provided on the inner surface of the housing 1. To these supporting members 59 is secured a swing lever 62 rotatably about a rotation shaft 63, said swing lever including engagement portions 60, 60 which are engaged with the end portions of the pickup base 8 and fitting pins 61 which is inserted into the cam recess 57 of the slide member 51.

Near the above mentioned lack gear 40, the gear changing member 66 having engaging pins 64, 65 is arranged movably in direction denoted by arrows e and f.

The engaging pin 65 is inserted into the guide recess 30 of the tray 23 and the engaging pin 64 is inserted into the guide recess 56 of the slide member 52. When the gear changing member 66 is moved in the directions shown by arrows e and f, the engagement of the rack gear 40 and the pinion gears 28 and 54 is changed.

Now the operation of the disk loading apparatus will be explained with reference to Fig. 4.

In an initial state of the disk loading, the tray 23 is in a position shown by Fig. 4a. In this condition, the rack gear 40 is engaged with the pinion gear 54 of the slide member 52, and the rack gear 40 is placed in the cut-out portion 28a of the pinion gear 28 on the side of the tray 23.

In this condition, the engaging pin 61 of the swing lever 62 engaged with the cam recess 57 is in a position A. The swinging strip 38 of the switch 32 is pushed by the taper portion 52a of the slide member 52 and is rotated in the direction d to detect electrically a condition that the loading has been completed.

In case of proceeding to the unloading condition from this condition, when an eject button not shown is operated, a driving current is supplied from a control unit also not shown to the driving motor 47.

Then, the driving shaft 45 of the driving motor 47 rotates in the clockwise direction, and the driving force of the driving motor 47 is transmitted to the small gear 44 via the belt 48 and pulley 43 and the large gear 41 rotates in the counter-clockwise direction. Then, the rack gear 40 rotated in the same direction.

When the rack gear 40 rotates, the slide member 52 is moved in the direction a via the pinion gear 54 engaging with the rack gear. In this case, the engaging pin 61 of the swing lever 62 engaged with the cam recess 57 of the rectangular strip portion 53 is moved along the cam recess 57 from the position A to a position B (refer to a condition shown in Fig. 4b).

In response to the movement of the engaging pin 61, the swing lever 62 is rotated, and when the swing lever 62 is further rotated, the locking portion 60 situating far from the end of the pickup base 8 is brought into contact with this end.

Then, the locking portion 60 of the swing lever 62 is locked at the end of the pickup base 8, and the pickup main body 2 is moved downward against the biasing force of the springs 4 within the slide bushes 5 while the pickup main body is in the horizontal state.

At the same time, the engaging pin 64 of the gear changing member 66 is moved in the direction f by the cam portion 55 of the guide recess 56 of the slide member 52, and the gear changing member 66 is moved in the same direction.

The engaging pin 64 of the gear changing member 66 is shifted and the tray 23 is moved slightly in the direction b via the cam portion 29 of the cam recess 30 of the tray 23.

Therefore, the pinion gear 28 of the tray 23 is engaged with the rack gear 40.

The engagement of the pinion gear 54 of the slide member 52 is released by the movement of the pinion gear 28 into the escaping portion 52a (refer to a condition illustrated in Fig. 4c).

The driving shaft 45 of the driving motor 47 still rotates and the tray 23 is moved in the direction b by means of the rack gear 40 and pinion gear 28.

When the tray 23 is moved in the direction b and comes to a position immediately before the unloading position, the swinging strip 38 of the switch 37 is rotated in the direction c by the taper portion 31 of the tray 23. Therefore, the power supply to the driving motor 47 is stopped.

When the tray 23 is further moved in the direction b, the stoppers 27 of the tray 23 are brought into contact with the projecting strips 34 of the supporting bridge 33 to stop the movement of the tray 23 (refer to a condition depicted in Fig. 4d).

Then, under this condition shown in Fig. 4d, i.e. in the unloading condition, after placing a disk D onto the disk supporting portion 24 of the tray 23, when a play button not shown is actuated, a current having an opposite phase (for instance, negative phase) is supplied to the driving motor 47, and the driving motor 47 rotates in the opposite direction to that explained above (counter clockwise direction).

The driving shaft 45 is rotated in the counter clockwise direction by the driving force of the driving motor 47, and the pulley 43 is rotated in the same direction via the small pulley 46 and belt 48. Then, the large gear 41 engaging with the small gear 44 below the pulley 43 is rotated in the clockwise direction. Therefore, the rack gear 40 is rotated in the same direction and the tray 23 is moved in the direction a by means of the pinion gear 28 which is engaged with the rack gear 40 (refer to a condition shown in Fig. 4d).

When the tray 23 has been moved immediately before the loading position, the engaging pin 65 of the gear changing member 66 is shifted in the direction f by the can portion 29 of the guide recess 30 of the tray 23. Therefore, the gear changing member 66 is moved in the same direction and the engaging pin 64 is shifted in the same direction. Then, the slide portion 52 is slightly moved in the direction b via the cam portion 55 of the slide portion 52, and the pinion gear 54 of the slide portion 52 is engaged with the rack gear 40 (a condition shown in Figs. 4c and 4d).

In this case, the rack gear 40 situates at the escaping portion 28a of the pinion gear 28 and the engagement of the pinion gear 28 with the rack gear 40 is released.

Next, the slide portion 52 is moved in the direction b via the pinion gear 54 and rack gear 40.

Therefore, the engaging pin 61 of the swing lever 62 is moved along the cam recess 57 of the rectangular strip portion 53 from the position B into the position A. At the same time, the swing lever 62 is rotated in the direction g and engaging portions 60 are moved upward.

In response to the movement of these engaging portions 60, the locked condition of the springs 4 within the slide bushes 5 is released and the pickup base 8 is pushed upward by the spring force. In the above explained manner, immediately before the pickup main body 2 is moved into the uppermost position, i.e. lading position, the turntable 11 is brought into contact with the disk D at its central portion and the disk D is pushed upward.

When the pickup main body 2 has moved into the loading position, the central portion of the disk D is clamped by the magnet clamper 32 (refer to a condition shown in Fig. 4a). In this condition, the pickup base 8 is supported horizontally by the four slide bushes 5 biased by the springs 4, and therefore the disk D is clamped in a horizontal state.

After that, the motor 12 is rotated, and at the same, poisoning of the pickup head 19 is carried out to reproduce information from the disk D. In this case, a distance between the pickup head 19 and the disk D is remained constant and the reproduction of information can be performed much more positively than the known apparatus in which the pickup base 8 is formed as a cantilever.

In this manner, in the present embodiment, the pickup base is moved vertically by means of the loading mechanism provided on one side, while the pickup base is kept horizontally. Therefore, a possibility of mis-clamping can be removed and the disk can be clamped positively at a given position. Since the loading mechanism is provided only on one side, it is no more necessary to provide a special cam mechanism and the apparatus can be simple in structure, less expensive in cost and easy in maintenance. Since the pickup base is supported by the biasing means having a anti-vibration faculty, the disk device can be effectively protected from an external impact.

In the present embodiment, the up down regulating means is constructed by the slide member 51 and swing lever 62, but the present invention is not limited to such an embodiment and an up down regulating mechanism having the both functions may be utilized.

Furthermore, the slide member 51 and swing lever 62 may be formed as a single unit to constitute the up down regulating means.

[Merits of the Invention]

As explained above, in the disk loading apparatus according to the invention, the turntable can be uniformly brought into contact with the central portion of the disk and the up down regulating means is provided on one side of the pickup base, the disk can be positively clamped by means of the simple structure.

4. Brief Description of the Drawings

Fig. 1 is a perspective view showing an embodiment of the disk loading apparatus according to the invention; Fig. 2 is an exploded perspective view illustrating the disk loading apparatus shown in Fig. 1; Figs. 3a and 3b are side views depicting a major portion of the disk loading apparatus shown in Fig. 1; Fig. 4 is a diagrammatic view for explaining the operation of the disk loading apparatus shown in Fig. 1, in which Fig. 4a shows the loading condition, Figs. 4b-4d illustrate the process to the unloading condition, and Fig. 4e depicts the unloading condition.

1···housing, 2···pickup main body, 4···spring, 5···slide bush, 8··· pickup base, 11···turntable, 12···motor, 13···supporting member, 14 slide shaft, 15···pulley, 16···belt, 17···stepping motor, 19···pickup head, 20···guide portion, 22···spring, 23···tray, 24···disk holding portion, 25···disk removing recess, 26···disk loading window, 27···

stopper, 28···pinion gear, 29···cam portion, 30···guide recess, 31···taper portion, 32···clamper, 33···supporting bridge, 35···loading mechanism, 37···switch, 38···swinging strip, 40···rack gear, 41···large gear, 43···pulley, 44···small gear, 47···driving motor, 48···belt, 51···slide member, 52···sliding portion, 53···rectangular strip portion, 54···pinion gear, 55···cam portion, 56···guide recess, 57···can recess, 58···guide recess, 62···swing lever, 64, 65···engaging pin, 66···gear changing member, D···disk